California Energy Commission
Public Interest Energy Research (PIER) Program
Energy Efficiency Research Office

Achieving Energy Savings Through Residential Energy Use Behavior Studies

Research Powers the Future
PIER Buildings End-use Energy Efficiency Research Program
www.energy.ca.gov/research/buildings

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Fact Sheet

The Issue

Understanding the factors that influence energy use behavior is a largely uninvestigated key research topic in energy efficiency. Occupant behaviors, such as operational practices and purchasing decisions, are important factors in achieving energy savings in buildings. However, little is understood as to why people make the choices they do, and how to influence those choices to achieve lower energy consumption.

Currently, home monthly utility bills provide delayed feedback in energy use behavior information. Energy efficiency program evaluation measures are correlated poorly with actual behavior, such as attitudes. There are questions related to consumer energy use, such as what kinds and sources of energy information do household residents want and need, and how should it be provided so that it effectively creates energy use awareness? Also, how can researchers accurately estimate the potential effects of various information strategies on home energy consumption and use the information to implement effective energy efficiency programs for the residential sector?

Technologies such as smart meters and home area networks – which are residential local area networks used for communication between digital devices deployed in the home, such as personal computers, printers, and mobile computing devices – will make more consumer energy use information available in shorter time frames.

Multiplayer game that tracks room-by-room energy use. Source: Bryon Reeves

Project Description

Project researchers and faculty from five centers and nine departments at Stanford University (Human Sciences and Technologies Advanced Research Institute and the Precourt Energy Efficiency Center) will create a common infrastructure for analyzing the effect of energy use behavior change strategies through a large-scale field research program. Energy-sensing devices will be installed in a group of test-bed homes.

A shared Web client will assess client responses to energy information with standardized energy use metrics, shared common software, databases, and computing services.

Using this common infrastructure, the effects of technologies, policies, community education, and media campaigns – such as interaction design, social networking, games and feedback interfaces –

will be assessed to determine their individual and synergistic influence on energy use behavior by individuals and households.

PIER Program Objectives and Anticipated Benefits for California

The project's objectives are to:

- Create an information platform with sensors, software, and databases that will transform the evaluation of energy efficiency programs.
- Design and implement field studies based on energy use behavior change strategies with control and treatment groups, recording who was exposed to what programs, and then objectively measuring specific energy reductions and shifts.
- Develop analytical models that can be used by utilities, decision makers, and program designers to create effective energy conservation programs and consumer incentives.

Project Specifics

Grant Award: PIR-10-054
Recipient: Stanford University
Application: Nationwide
Amount: $500,000
Term: January 2010 to October 2012
Cofunding: $5,006,011 from U.S. Department of Energy
Cofunding $790,791 from Stanford University

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